# The SPRINT-2 High Performance Packet Controller

PacComm announces the SPRINT-2 High Performance Packet Controller, a new third-generation packet controller designed for the second decade of packet.

The SPRINT-2 is the ideal TNC for the modern (9600 bps & faster) packet station & for BBS, satellite and NODE use.

**The SPRINT-2 is built for reliable high performance, yet is very affordable.**

Uses reliable, tested technology (G3RUH modem, TNC-2 CPU architecture) with large-scale programmable logic circuits to reduce cost for solid, reliable performance.

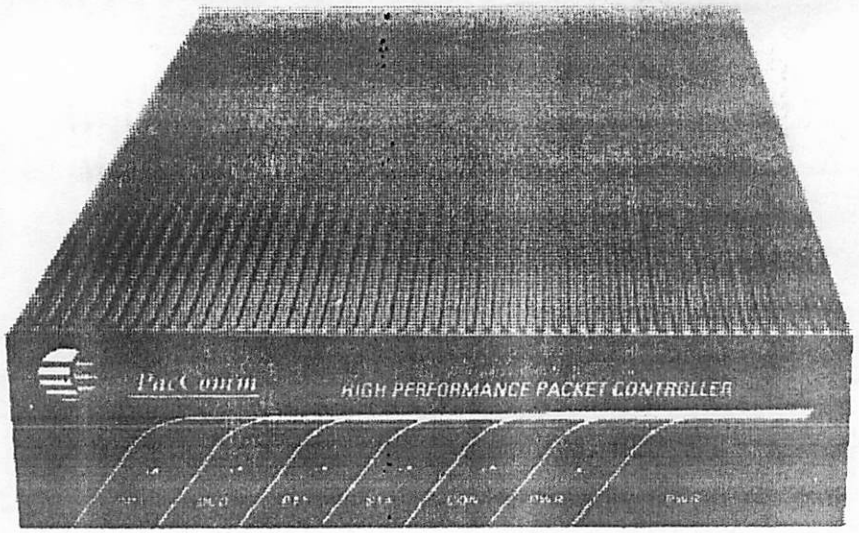
## Firmware Features

PacComm firmware uses TAPR style commands with many PacComm extensions and improvements, including KISS (see PacComm firmware page for more details).

- Special command set to support Global Positioning System (GPS) receivers. APRS compatible.
- Special commands support Deviation meter and Signal Strength accessory board (see AD4 page).
- Personal Message System features forwarding, reverse forwarding to other PMS & to BBS. Forwards via network connections or directly. Many powerful features.

## Digital Section Features

- 512kbit (64k Byte) EPROM.
- 128k RAM provides 64k of Personal Message System storage and large send and receive buffers.
- TNC-2 compatible design works with any TNC-2 EPROM.
- Bank-switching circuit for TheNet. Ready to run TheNet X1J or later EPROM.
  - » No wiring modifications required, just set jumpers.
- 9.8 MHz CPU clock speed and 10 MHz rated parts are standard. 20 MHz CPU option.




**The PacComm SPRINT-2 Packet Controller**

- Terminal baud rates from 9.6 kb up to 57.6 kb for satellite file downloads without dropped frames.

FAST
POWERFUL
RUGGED
RELIABLE
QUIET
SENSITIVE
EXPANDABLE
INEXPENSIVE
**THIS IS NOT A TOY TNC!**

## Modem Features

- G3RUH design modem with PLL demodulation for outstanding performance.
- Two independent modem transmit and receive filter sections to allow jumper selection of two radio baud rates with optimum transmit and receive filtering for each.
- Radio baud rates from 4.8 kb up to 57.6 kb are supported for fast satellites and network node use.

## User Features

- Six LEDs. Power (red), Connect (green), Status (yellow), Push to Talk (red), DCD (green) and OPT (a multi-purpose dual color LED).
  - » When used with the CoaxLAN, red and green indicate transmit and receive data on the LAN.
- Black anodized aluminum case; rugged, attractive, and RFI/EMI resistant.
- Extensive RFI/EMI filtering. This is a quiet TNC!

## Reliability Features

- Radio and serial port lines extensively filtered against RF and noise effects.
- NMOS (not CMOS) RS-232 interface ICs for increased resistance to voltage spikes.
- Major RS-232 and radio lines and power feed are protected against power spikes with on-board surge surpressors (Transorbs).

## Network Features

- TNC-2 EPROM compatible, TheNET X1 ready, Processing

power and modem performance for serious throughput.

- PacComm's CoaxLAN circuit is built in for easily interconnecting multiple SPRINT-2s for node stacks. Works with NET/ROM, TheNET, and ROSE. No more need for diode matrices!

  » Interconnect the SPRINT-2 to TINY-2 and MFJ node units by adding CoaxLAN adapters to those TNCs' TTL ports.

## Standard and Optional Accessories

The SPRINT-2 is delivered with:

- Operating Manual and 'Quick-Start Card' (Standard and Satellite models only).
- Hardware Manual with all schematics
- Computer cable to fit 9 pin PC serial port.
- Unterminated radio cable.
- Power supply (120vac to 12vdc) and cable.
- Accessory socket cable plug.

## SPRINT Models

The SPRINT-2 is offered in four configurations: Standard model for ham shack and BBS use, Satellite model, Node model, and a 20 MHz Backbone model.

### Standard Model

- 128k RAM.
- PacComm firmware including PMS.
- Main modem filters configured for 9600 bps and auxiliary modem filters unconfigured.

### Satellite Model

- 128k RAM.
- PacComm Firmware.
- Modem configured for 9.6 and 38.4 kbps.

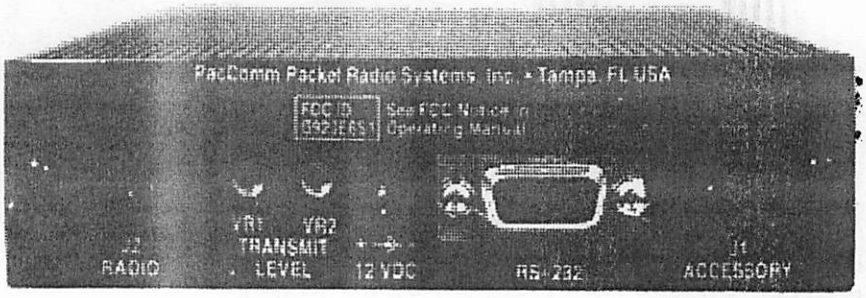
### Node Model

- 32k RAM.
- Blank 27C512 EPROM (factory burned TheNet X1J or ROSE at $15 extra - please specify all parameter defaults required).
- Modem configured for 9.6 and 38.4 kbps. Other speeds upon request.

### Backbone Model

- 32 k 70 nanosecond RAM.
- Blank 27C512 55 nanosecond EPROM.
- 20 MHz CPU running at 19.6 MHz.
- Modems configured for 38.4 and 57.6 kb.

Custom RAM sizes, CPU speed and modem filters available on special order.




**G3RUH Modem Technology vs. Other Modem Designs**

Let the Buyer Beware!

Other manufacturers use either a single chip modem design for 9600 signals, or some provide a 'simplified' design similar to the G3RUH modem.

They may create a 'similar' design to avoid the costs of licensing the G3RUH design, or to save a few components, but 'similar' designs do not have the G3RUH performance. Modem design is no place to cut corners!

PacComm designed and builds an integrated circuit 38.4 kb commercial packet modem using integrated circuit modem technology. It has excellent performance in closed systems (signals between like units), but the G3RUH design was planned for and excells in amateur service.

Ask around - which modem designs are working and which are giving people trouble? Why do the majority of 9600 satellite stations use the G3RUH design? Why do the satellite builders use the G3RUH design?

PacComm has been building G3RUH 9600 modems since 1988! We have built more than all other US manufacturers combined. We also know it costs less to build an integrated circuit 9600 TNC, but we do it the right way. (By the way, how come our unit costs less than the 'cheap' kind?)

Do you want to be a guinea pig for some corner-cutting manufacturer? Think it through before you buy!

**RF Baud Rate vs. Bandwidth in the SPRINT-2 implementation of the G3RUH Direct FM Modem**

| | |
|---|---|
| 4.8 kb | 8 kHz |
| 9.6 kb | 15 kHz |
| 19.2 kb | 30 kHz |
| 38.4 kb | 60 kHz |
| 57.6 kb | 90 kHz |

**But it can't do 1200 baud!!**

Probably 98% of the people reading this catalog have at least one 1200 baud TNC.

With all the new 9600 baud capable radios, you're thinking the time is right to move up to 9600. So why in the world would you want another 1200 baud unit?

You already have a 1200 baud TNC wired to a 1200 baud radio, so why discard the cable and radio, as well as your 1200 baud TNC so you can have both 1200 and 9600 baud packet in one box? It serves no purpose!

Spend your money wisely. Keep your 1200 baud station and get expandable next generation equipment for 9600 and beyond.

If you are just getting started and also need 1200 baud capability, look at PacComm's TNC-NB96.

| Product -> Feature | SPRINT-2 (Standard) | TINY-2 MK-2 | MICRO PWR-2 | TNC-NB96 | Handi Packet | TNC-320 | PC-320 | PSK-1T | PSK-1 | PacTOR | PC-120/PC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Purpose | High Speed DFM Packet | 1200 Bd AFSK | Low Power 1200 Bd AFSK | 1200 AFSK& 9600 DFM | Portable 1200 Baud AFSK | 300, 1200 Baud AFSK | 300, 1200 Baud AFSK | 1200 Baud PSK & AFSK | 1200 Baud PSK | 100-200 Bd PACTOR AMTOR | 1200 Baud AFSK |
| CPU/Speed | 84C00/10 (20 MHz opt) | 86C00/5 (10 MHz opt) | 84C00/5 (10 MHz opt) | 84C00/5 (10 MHz opt) | 84C00/5 (10 MHz opt) | 85C00/5 (10 MHz opt) | 84C00/5 (10 MHz opt) | 84C00/5 68HC11 | 68HC11 | 84C00/5 | None |
| HDLC | 84C40 | 84C40 | 84C40 | 84C40 | 85C30 | 8530 | 8530 | 84C40 | - | MK3801 | 8530 |
| Base RAM (battery backed) | 128k | 32k | 32k | 32k | 32k | 32k | 32k | 32k | 32k | 32k | None |
| RAM Expandable | No | MEM EXP | MEM EXP | No | No | MEM EXP | MEM EXP | No | No | No | N/A |
| Personal Message System | 64k | 12k | 4k w/printer | 12k | 15k | 11k | 11k | No | 12k | Mailbox | N/A |
| GPS Firmware Support | Yes | Yes | Yes | Yes | Yes | Partial | Partial | Yes | N/A | No | N/A |
| Modem Disconnect | Yes | Yes | Yes | Yes | Non-TAPR | Yes | Yes | No | N/A | No | Yes |
| Printer Port | No | No | Option | No | No | No | No | No | No | No | N/A |
| TTL Serial Port | No | Yes | Yes | No | No | No | N/A | No | No | No | N/A |
| Serial Port Speeds | 4800-57600 | 300-38400 | 300-38400 | 300-38400 | 300-19200 | 300-19200 | 300-19200 | 300-38400 | 1200-9600 | 1200-9600 | N/A |
| Radio Port Speeds (standard modem bypassed) | 4800-57600 | 300-38400 | 300-38400 | 300-38400 | 300-19200 | 300-19200 | 300-19200 | 300-38400 | 300-1200 | N/A | 300-115300 |
| Internal Battery Pack | No | No | No | No | 10 Hrs | No | No | No | No | No | N/A |
| Cables & PS Provided | Yes | No | No | Yes | Yes | No | No | Yes | Yes | Yes | Cable |
| AD-4 Option | Yes | Yes | Yes | No | No | Yes | Yes | No | No | No | No |
| CoaxLAN | Built-In | Yes | Yes | No | No | No | No | No | No | No | No |
| Real Time Clock | Yes | Yes | Yes | No | No | Yes | Yes | No | No | No | N/A |
| Internal GPS Available | No | Yes | No | No | No | No | No | No | No | No | N/A |
| GPS Firmware Support | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No | N/A |
| TheNet Firmware Compatible | Yes | Yes | Yes | Yes | No | No | No | Yes | N/A | N/A | Yes |
| ROSE Firmware Compatible | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | N/A | Yes |
| KISS for TCP/IP, PB, PG | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No | No |
| WA8DED Host Mode | No | Yes | Yes | Yes | No | No | Yes | Yes | Yes | No | No |
| Size (mm)(HxWxL) | 33,125, 236 | 33,125, 188 | 33,125, 188 | 45,150, 188 | 33,65, 118 | 45,150, 188 | 19,127, 273 | 45,150, 188 | 45,150, 188 | 45,150, 188 | Half-card |
| Size (inches)(HxWxL) | 1.3,4.9, 9.3 | 1.3,4.9, 7.4 | 1.3,4.9, 7.4 | 1.8,5.9, 7.4 | 1.3,2.55 ,4.65 | 1.8,5.9, 7.4 | 0.8,5, 10.8 | 1.8,5.9, 7.4 | 1.8,5.9, 7.4 | 1.8,5.9, 7.4 | " |
| Weight (grams) | 737 | 510 | 510 | 935 | 340 | 765 | 255 | 963 | 793 | 652 | 180 |
| Weight (Ounces) | 26 | 18 | 18 | 33 | 12 | 27 | 9 | 34 | 28 | 23 | 7 |
| Power Consumption (mA) | 350 | 55 | 40 | 100 | 50 | 320 | 100 | 220 | 180 | 200 | 0.5W |
| Price | $225 | $149 | $175 | $295 | $229 | $195 | $195 | $375 | $235 | $285 | $99 |

## PacComm's Family of G3RUH Modems

PacComm has been producing modems based on the famous G3RUH design since 1988. This modem is used on many of the amateur satellites and is the standard for amateur radio 9600 bd operation. The G3RUH design is compatible with the K9NG design pioneered by TAPR and with recent single chip modems using the same modulation scheme.

For years we have called our line of direct FM (DFM) modems "The PacComm Narrowband 9600 Packet Radio System," or NB-96 Series.

So while our system name refers to a particular data rate, please keep in mind that the G3RUH design is highly effective from 4800 baud to 64kb and above.

Times are changing. You can now get several "off-the-shelf" 9600 baud capable radios from major amateur manufacturers, and higher speed radios can't be far away. The Phase 3D satellite will offer up to 56kb digital channels!

### Bandwidth

The NB-96 modem operated at 9600 baud complies with FCC bandwidth limitations on the 6 and 2 meter amateur bands as well as higher frequencies.

Digital generation of the transmit audio waveform allows very tight control of the transmit audio bandwidth.

### Bandwidth at various Data Rates

| Baud Rate | Deviation | Bandwidth |
|---|---|---|
| 4800 | +/- 1.5 kHz | 8 kHz |
| 9600 | +/- 3 kHz | 15 kHz |
| 19200 | +/- 6 kHz | 30 kHz |
| 38400 | +/- 12 kHz | 60 kHz |
| 57600 | +/- 18 kHz | 90 kHz |
| 64000 | +/- 20 kHz | 100 kHz |

### Technical Specifications

- NOTE: The modem connects directly to the radio's varactor and discriminator and may not be suitable for all radios.
- The transmit modulator uses an 8 bit digital F.I.R. transversal filter in EPROM for waveform generation. Typically -6 dB at 4800 Hz, -50 db at 7500 Hz.
- Deviation of +/- 3kHz gives a bandwidth under the 20 kHz required by the FCC at the -60dB point.
- Output adjustable 0-8V p-p.
- 17 bit maximal length LFSR scrambler, jumper selectable data or bit error rate test mode.
- Discriminator audio input, 50mV to10V peak-to-peak. 3rd order Butterworth filter, 6kHz. Data Detection (DCD) circuit. Independent un-scrambler.
- Clock recovery circuit average lock time is 5 ms (50 bits.)
- The only set-up adjustment is Transmit Audio level.

## MC-NB96 Internal DFM Modem Card

The MC-NB96 internal modem card is designed to attach directly to the TAPR style modem disconnect found on all PacComm and other quality TNCs.

Combine it with the TINY-2 MK-2 Node for an economical 9600/19200 bps network link.

Also fits all all PacComm TNCs, all TNC-2 derivatives and TNC-2 compatibles with a modem disconnect header.

The low cost alternative for upgrading existing 1200 baud network links to 9600 bps or 19200 bps or higher.

The MC-NB96 has been engineered to offer the features shown below. It has been tested with excellent results at over 100k bps.

- All baud rate sensitive components mounted on a plug-in header. NEW! Header now contains 14 components for optimum operation up to 56kb.
- Transmit and receive sections are isolated for superior full duplex performance.
- Transmit and receive voltage references are separated and Zener diode stabilized.
- NEW! Transmit audio may be enabled or disabled during receive operation.
- An on-board DCD LED makes troubleshooting convenient.
- The DCD signal may be jumpered to be active high or low.
- DCD circuitry provides a stable DCD indication.
- NEW! Receive audio may be gated by the DCD signal or run continuously.
- Comprehensive bypassing and a large ground plane make the board very quiet.

### Radio Mod Filters

PacComm offers TEKK KS-900 and KS-960 telemetry radios with optimum filters installed for 9600 or 19,200 bd. These perform better than the standard units.

- KS-900L-D96 w/'D' filter, wide 21.4 filters
- KS-900L-D192 w/'C' filter, wide 21.4 filters
- KS-960L-D96 w/'D' filter, wide 21.4 filters
- KS-960L-D192 w/'C' filter, wide 21.4 filters

We also sell separately the good digital filters used in the above radios for those amateurs who wish to modify their own radio.

- Digital 'C' filters for 19.2 kb
  +/- 12.5 kHz @ -6 dB; +/- 30 kHz @ -50 dB
  Part # SFH455C
- Digital 'D' filters for 9.6 kb
  +/- 10 kHz @ -6dB; +/- 25 kHz @ -50 dB
  Part # SFH455D
- Monolithic 21.4 MHz digital filters
  Part # MCF21.4F30B